

What is claimed is:

1. A gas concentration detecting apparatus comprising:

5 a gas concentration sensor equipped with a sensor element having a solid electrolytic substrate for detecting a gas concentration of a specific component contained in a sensing objective gas and a heater for heating said sensor element to a predetermined activated condition,

a sensor control unit for measuring a weak element current flowing in said sensor element in accordance with the concentration of said specific  
10 component and for intermittently supplying electric power to said heater, and

a wiring unit for providing electric connection between said gas concentration sensor and said sensor control unit, wherein

said wiring unit comprises an element current cable used for  
15 measuring the element current and a heater cable used for supplying electric power to said heater, and

a shielding layer fixed to a ground potential is provided outside a core wire of said element current cable through which said element current flows.

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2. The gas concentration detecting apparatus in accordance with claim 1, wherein said element current cable comprises a sheathing layer surrounding said core wire and said shielding layer covers the outside of said sheathing layer.

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3. The gas concentration detecting apparatus in accordance with claim 2, wherein a volume resistivity of said sheathing layer is equal to or larger than  $1.0 \times 10^{12} (\Omega \cdot \text{cm})$ .

30 4. The gas concentration detecting apparatus in accordance with

claim 2, wherein said sheathing layer is made of Teflon (registered trademark).

5        5. The gas concentration detecting apparatus in accordance with claim 1, wherein said element current cable includes a plurality of core wires that are collectively covered with said shielding layer.

10       6. The gas concentration detecting apparatus in accordance with claim 1, wherein said element current cable includes at least one core wire covered with a sheathing layer, and said shielding layer is located outside said sheathing layer, and further a protecting layer is provided outside said shielding layer.

15       7. The gas concentration detecting apparatus in accordance with claim 1, wherein said element current cable includes a plurality of core wires each being covered with a sheathing layer, and said shielding layer is located outside said plurality of core wires, and further a protecting layer is provided outside said shielding layer.

20       8. The gas concentration detecting apparatus in accordance with claim 1, wherein the ground processing for fixing said shielding layer of said element current cable to the ground potential is carried out separately from the ground processing for fixing said heater to the ground potential.

25       9. The gas concentration detecting apparatus in accordance with claim 1, wherein said wiring unit is connected to said sensor control unit via a connector member, and a shield surrounds the outer surface of said connector member.

30       10. The gas concentration detecting apparatus in accordance with

claim 1, wherein an element current connector used for connecting said element current cable to said sensor control unit is provided separately from a heater connector used for connecting said heater cable to said sensor control unit.

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11. The gas concentration detecting apparatus in accordance with claim 1, wherein a control circuit section included in said sensor control unit is accommodated in a closed space of a casing that is made of an electrically-conductive material and fixed to the ground potential, and a feedthrough capacitor is disposed on a wall portion of said casing, and further a connecting circuit section electrically connected to said wiring unit is disposed outside said closed space, and said connecting circuit section and said control circuit section are electrically connected via said feedthrough capacitor.

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12. The gas concentration detecting apparatus in accordance with claim 1, wherein

a casing made of an electrically-conductive material and fixed to the ground potential is divided into two chambers with a partition plate made of an electrically-conductive material and fixed to the ground potential,

a feedthrough capacitor is disposed on said partition plate,

a control circuit section included in said sensor control unit and a connecting circuit section electrically connected to said wiring unit are respectively accommodated into said two chambers, and

said control circuit section and said connecting circuit section are electrically connected via said feedthrough capacitor.

13. A gas concentration detecting apparatus comprising:

a gas concentration sensor equipped with a sensor element having a solid electrolytic substrate for detecting a gas concentration of a specific

component contained in a sensing objective gas and a heater for heating said sensor element to a predetermined activated condition,

a sensor control unit for measuring a weak element current flowing in said sensor element in accordance with the concentration of said specific component and for intermittently supplying electric power to said heater, and

a wiring unit for providing electric connection between said gas concentration sensor and said sensor control unit, wherein

a control circuit section included in said sensor control unit is accommodated in a closed space of a casing that is made of an electrically-conductive material and fixed to the ground potential,

a feedthrough capacitor is disposed on a wall portion of said casing,

a connecting circuit section electrically connected to said wiring unit is disposed outside said closed space, and

said connecting circuit section and said control circuit section are electrically connected via said feedthrough capacitor.

#### 14. A gas concentration detecting apparatus comprising:

a gas concentration sensor equipped with a sensor element having a solid electrolytic substrate for detecting a gas concentration of a specific component contained in a sensing objective gas and a heater for heating said sensor element to a predetermined activated condition,

a sensor control unit for measuring a weak element current flowing in said sensor element in accordance with the concentration of said specific component and for intermittently supplying electric power to said heater, and

a wiring unit for providing electric connection between said gas concentration sensor and said sensor control unit, wherein

a casing made of an electrically-conductive material and fixed to a ground potential is divided into two chambers with a partition plate made of

an electrically-conductive material and fixed to the ground potential,

a feedthrough capacitor is disposed on said partition plate,

a control circuit section included in said sensor control unit and a  
connecting circuit section electrically connected to said wiring unit are  
5 respectively accommodated into said two chambers, and

said control circuit section and said connecting circuit section are  
electrically connected via said feedthrough capacitor.

15. The gas concentration detecting apparatus in accordance with  
10 claim 12, wherein said control circuit section and said connecting circuit  
section are provided on the same circuit substrate, and said partition plate is  
provided on said circuit substrate so that said partition plate extends  
vertically between said control circuit section and said connecting circuit  
section.

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16. The gas concentration detecting apparatus in accordance with  
claim 14, wherein said control circuit section and said connecting circuit  
section are provided on the same circuit substrate, and said partition plate is  
provided on said circuit substrate so that said partition plate extends  
20 vertically between said control circuit section and said connecting circuit  
section.

17. The gas concentration detecting apparatus in accordance with  
claim 11, wherein a capacitance of said feedthrough capacitor is equal to or  
25 larger than 1000 pF.

18. The gas concentration detecting apparatus in accordance with  
claim 13, wherein a capacitance of said feedthrough capacitor is equal to or  
larger than 1000 pF.

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19. The gas concentration detecting apparatus in accordance with claim 14, wherein a capacitance of said feedthrough capacitor is equal to or larger than 1000 pF.

5           20. The gas concentration detecting apparatus in accordance with claim 1, wherein said sensor element comprises

          a first cell for discharging or pumping oxygen out of or into the sensing objective gas in a chamber,

          a second cell for decomposing the specific component contained in  
10   the gas after said gas passed said first cell and detecting a gas concentration of said specific component based on an oxygen ion amount moving during decomposition of said specific component, and

          said sensor control unit measures a weak current flowing at least in said second cell.

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          21. The gas concentration detecting apparatus in accordance with claim 14, wherein said sensor element comprises

          a first cell for discharging or pumping oxygen out of or into the sensing objective gas in a chamber,

20           a second cell for decomposing the specific component contained in the gas after said gas passed said first cell and detecting a gas concentration of said specific component based on an oxygen ion amount moving during decomposition of said specific component, and

          said sensor control unit measures a weak current flowing at least in  
25   said second cell.

          22. The gas concentration detecting apparatus in accordance with claim 14, wherein said sensor element comprises

30           a first cell for discharging or pumping oxygen out of or into the sensing objective gas in a chamber,

a second cell for decomposing the specific component contained in the gas after said gas passed said first cell and detecting a gas concentration of said specific component based on an oxygen ion amount moving during decomposition of said specific component, and

- 5           said sensor control unit measures a weak current flowing at least in said second cell.

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